Amendments to the Claims:

1.   (currently amended) An image segmentation method, said method comprising:

    a)   obtaining pixel attribute data for a mixed-content image;

    b)   identifying a text region in said image;

    c)   identifying a background region in said image, wherein said identifying comprises

        i)   calculating a luminance histogram for said image,

        ii)   identifying a histogram bin containing a maximum number of values,

        iii)   comparing said maximum number of values to a threshold value, and

        iv)   classifying a pixel as background if said pixel corresponds to said histogram bin and said maximum number of values is greater than said threshold value;

    d)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions, wherein said analyzing comprises;

        i)   calculating an area luminance histogram for said areas not classified as background or text,

        ii)   determining a number of populated histogram bins whose pixel count exceeds a threshold value,

        iii)   comparing said number of populated histogram bins to a bin number threshold value,

        iv)   classifying said area as a contone region when said number of populated histogram bins exceeds said bin number threshold value;

    e)   analyzing said contone regions to identify any text regions present within said contone regions;

    f)   analyzing said contone regions to identify any background regions present in said contone regions;

    g)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions; and

    h)   repeating steps e-g until no further sub-regions are found.

2. (currently amended) ~~An image segmentation~~ The method as described in claim 1
    further comprising analyzing said contone regions and said contone sub-
    regions to identify pictorial contone regions.

3. (currently amended) ~~An image segmentation~~ The method as described in claim 1
    further comprising <u>progressively expanding said background region beyond
    said initial maximum histogram bin into neighboring histogram bins when
    said neighboring histogram bins contain a sufficient number of pixels</u> ~~filtering
    said pixel data to remove noise~~.

4. (currently amended) ~~An image segmentation~~ The method as described in claim 1
    further comprising morphological processing of any of said text regions and
    any of said background regions to eliminate small isolated regions.

5. (currently amended) ~~An image segmentation~~ The method as described in claim 1
    further comprising <u>removing any contone regions whose area is smaller than
    one tenth of the square of the page width</u> ~~connected component labeling~~.

6. (currently amended) ~~An image segmentation~~ The method as described in claim 1
    further comprising <u>analyzing said contone regions and said contone sub-
    regions to identify pictorial contone regions and non-pictorial contone regions,
    wherein said analyzing to identify pictorial contone regions comprises
    eliminating the two histogram bins containing the highest number of pixels
    and analyzing the remaining bins for bi-modal distribution</u> ~~computing a
    bounding box for a region~~.

7.   An image segmentation method, said method comprising:

   a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

   b)   downsampling said pixel data;

   c)   filtering said pixel data to remove noise;

   d)   computing a local feature to identify a text region in said image;

   e)   analyzing a luminance histogram of said image to identify a background region in said image, wherein said analyzing comprises

       i)   <u>calculating a luminance histogram for said image,</u>

       ii)   <u>identifying a luminance histogram bin containing a maximum number of values,</u>

       iii)   <u>comparing said maximum number of values to a threshold value, and</u>

       iv)   <u>classifying a pixel as background if said pixel corresponds to said histogram bin and said maximum number of values is greater than said threshold value;</u>

   f)   ~~labeling any background regions as such;~~

   g)   ~~applying morphological processing to said background regions and said text regions;~~

   h)   analyzing a chrominance histogram of said image to verify a background region in said image, wherein said analyzing comprises

       i)   <u>calculating a chrominance histogram for said image,</u>

       ii)   <u>identifying a chrominance histogram bin containing a maximum number of values,</u>

       iii)   <u>comparing said chrominance histogram bin to said luminance histogram bin, and</u>

       iv)   <u>removing a pixel from a background classification if said chrominance histogram bin and said luminance bin are not substantially similar;</u>

   i)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

   j)   analyzing said contone regions to identify any text regions present within said

contone regions;

k)   analyzing said contone regions to identify any background regions present in said contone regions;

l)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

m)   repeating steps e-g until no further sub-regions are found; and

n)   analyzing said contone regions and said contone sub-regions to identify pictorial contone regions.

8.   (canceled)

9.   (canceled)

10. (currently amended) An image segmentation method, said method comprising:

   a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

   b)   downsampling said pixel data;

   c)   filtering said pixel data to remove noise;

   d)   computing a local ~~discriminating~~ feature to identify a text region in said image;

   e)   analyzing a luminance histogram of said image to identify a background region in said image;

   f)   labeling any background regions as such;

   g)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

   h)   analyzing said contone regions to identify any text regions present within said contone regions;

   i)   analyzing said contone regions to identify any background regions present in said contone regions;

   j)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

   k)   repeating steps e-g until no further sub-regions are found; and

   l)   analyzing said contone regions and said contone sub-regions to identify contone regions and non-contone regions.

11. (currently amended) ~~An image segmentation~~ The method as described in claim 10 wherein said local ~~discriminating~~ feature is a standard deviation.

12. (currently amended) ~~An image segmentation~~ The method as described in claim 10 wherein said local ~~discriminating~~ feature is spread.

13. An image segmentation method, said method comprising:

    a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

    b)   downsampling said pixel data;

    c)   filtering said pixel data to remove noise;

    d)   computing a local ~~discriminating~~ feature, selected from the group consisting of standard deviation and spread, to identify a text region in said image, wherein a region is identified as text when said feature is above a local feature threshold value;

    e)   analyzing a luminance histogram of said image to identify a background region in said image, wherein a region is identified as background when an initial maximum histogram bin containing the highest number of pixels exceeds a background threshold value;

    f)   verifying said background region analysis using ~~region~~ chrominance histogram data;

    g)   labeling any background regions as such;

    h)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

    i)   analyzing said contone regions to identify text regions present within said contone regions;

    j)   analyzing said contone regions to identify background regions present in said contone regions;

    k)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

    l)   repeating steps e-g until no further sub-regions are found; and

    m)   analyzing said contone regions and said contone sub-regions to identify pictorial contone regions and non-pictorial contone regions.

14. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said local ~~discriminating~~ feature is standard deviation and said local feature threshold value is 32.

15. (currently amended) ~~An image segmentation~~ The method as described in claim 13

wherein said background threshold value is related to an image size.

16. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said background threshold value is 12.5% of image size.

17. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said identification of ~~a~~ the background region is independent of image element color.

18. (canceled)

19. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said identification of a background region further comprises the use of a chroma foreground mask and a hue foreground mask.

20. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said identification of contone regions comprises analyzing luminance histogram bins to determine the number of bins (N_{pop}) containing more pixels than a contone threshold value, wherein ~~a~~ the region is considered a contone region when N_{pop} exceeds a uniformity threshold value.

21. (currently amended) ~~An image segmentation~~ The method as described in claim 13 wherein said analysis to identify contone regions comprises verification using region properties.

22. (currently amended) ~~An image segmentation~~ The method as described in claim 21 wherein said region properties comprise area.

23. (canceled)

24. (canceled).

25. (currently amended) An image segmentation apparatus, said apparatus comprising:

   a)   a reader for obtaining pixel attribute data for a mixed-content image;

   b)   a text identifier for identifying a text region in said image;

   c)   a background identifier for identifying a background region in said image, said background analyzer comprising,

      i)   a calculator for calculating a luminance histogram for said image,

      ii) an identifier for identifying a histogram bin containing a maximum number of values, and

      iii) a classifier for classifying a pixel as background if said pixel corresponds to said histogram bin and said maximum number of values is greater than a threshold value;

   d)   a contone analyzer for analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions, said contone analyzer comprising;

      i)   a calculator for calculating an area luminance histogram for said areas not classified as background or text,

      ii) a determiner for determining a number of populated histogram bins whose pixel count exceeds a threshold value, and

      iii) a classifier for classifying said area as a contone region when said number of populated histogram bins exceeds a bin number threshold value;

   e)   wherein said text analyzer may analyze said contone regions to identify any text regions present within said contone regions;

   f)   wherein said background analyzer may analyze said contone regions to identify any background regions present in said contone regions;

   g)   wherein said contone analyzer may analyze areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions; and

   h)   wherein said text analyzer, said background analyzer and said contone analyzer may operate recursively on regions and sub-regions to identify nested regional attributes.

26. (currently amended) A computer-readable medium comprising <u>computer-executable</u> instructions for:

a) obtaining pixel attribute data for a mixed-content image;

b) identifying a text region in said image;

c) identifying a background region in said image<u>, said identifying comprising,</u>
   i) <u>calculating a luminance histogram for said image,</u>
   ii) <u>identifying a histogram bin containing a maximum number of values,</u>
   iii) <u>comparing said maximum number of values to a threshold value, and</u>
   iv) <u>classifying a pixel as background if said pixel corresponds to said histogram bin and said maximum number of values is greater than said threshold value;</u>

d) analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions<u>, said analyzing comprising,</u>
   i) <u>calculating an area luminance histogram for said areas not classified as background or text,</u>
   ii) <u>determining a number of populated histogram bins whose pixel count exceeds a threshold value,</u>
   iii) <u>comparing said number of populated histogram bins to a bin number threshold value,</u>
   iv) <u>classifying said area as a contone region when said number of populated histogram bins exceeds said bin number threshold value;</u>

e) analyzing said contone regions to identify any text regions present within said contone regions;

f) analyzing said contone regions to identify any background regions present in said contone regions;

g) analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions; and

h) repeating steps e-g until no further sub-regions are found.

27. (new) An image segmentation method, said method comprising:

    a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

    b)   downsampling said pixel data;

    c)   filtering said pixel data to remove noise;

    d)   computing a local discriminating feature, selected from the group consisting of standard deviation and spread, to identify a text region in said image, wherein a region is identified as text when said feature is above a local feature threshold value;

    e)   analyzing a luminance histogram of said image to identify a background region in said image, wherein a region is identified as background when an initial maximum histogram bin containing the highest number of pixels exceeds a background threshold value;

    f)   progressively expanding said background region beyond said initial maximum histogram bin into neighboring histogram bins when said neighboring histogram bins contain a sufficient number of pixels;

    g)   verifying said background region analysis using region chrominance data;

    h)   labeling any background regions as such;

    i)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

    j)   analyzing said contone regions to identify text regions present within said contone regions;

    k)   analyzing said contone regions to identify background regions present in said contone regions;

    l)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

    m)   repeating steps e-g until no further sub-regions are found; and

    n)   analyzing said contone regions and said contone sub-regions to identify pictorial contone regions and non-pictorial contone regions.

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28. (new) An image segmentation method, said method comprising:

   a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

   b)   downsampling said pixel data;

   c)   filtering said pixel data to remove noise;

   d)   computing a local discriminating feature, selected from the group consisting of standard deviation and spread, to identify a text region in said image, wherein a region is identified as text when said feature is above a local feature threshold value;

   e)   analyzing a luminance histogram of said image to identify a background region in said image, wherein a region is identified as background when an initial maximum histogram bin containing the highest number of pixels exceeds a background threshold value;

   f)   verifying said background region analysis using region chrominance data;

   g)   labeling any background regions as such;

   h)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

   i)   verifying said contone regions using region properties, wherein said contone regions are eliminated when a contone region's area is smaller than the square of one tenth of the page width;

   j)   analyzing said contone regions to identify text regions present within said contone regions;

   k)   analyzing said contone regions to identify background regions present in said contone regions;

   l)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

   m)   repeating steps e-g until no further sub-regions are found; and

   n)   analyzing said contone regions and said contone sub-regions to identify pictorial contone regions and non-pictorial contone regions.

29. (new) An image segmentation method, said method comprising:

   a)   obtaining pixel attribute data for a mixed-content image, said pixel attribute data comprising at least one of a luminance data, a chrominance data and a hue data;

   b)   downsampling said pixel data;

   c)   filtering said pixel data to remove noise;

   d)   computing a local discriminating feature, selected from the group consisting of standard deviation and spread, to identify a text region in said image, wherein a region is identified as text when said feature is above a local feature threshold value;

   e)   analyzing a luminance histogram of said image to identify a background region in said image, wherein a region is identified as background when an initial maximum histogram bin containing the highest number of pixels exceeds a background threshold value;

   f)   verifying said background region analysis using region chrominance data;

   g)   labeling any background regions as such;

   h)   analyzing areas in said image outside any of said background regions and outside any of said text regions to identify contone regions;

   i)   analyzing said contone regions to identify text regions present within said contone regions;

   j)   analyzing said contone regions to identify background regions present in said contone regions;

   k)   analyzing areas in said contone regions outside any of said background regions and outside any of said text regions to identify contone sub-regions;

   l)   repeating steps e-g until no further sub-regions are found; and

   m)   analyzing said contone regions and said contone sub-regions to identify pictorial contone regions and non-pictorial contone regions, wherein said analyzing to identify pictorial contone regions comprises eliminating the two histogram bins containing the highest number of pixels and analyzing the remaining bins for bi-modal distribution.